

WHAT IS CLAIMED IS:

1 1. A non-woven mat of chopped strands, comprising:
2 a plurality of fibers disposed in a non-woven configuration to define a mat;
3 at least 20% of said fibers in fiber bundles having between 5-450 fibers per bundle
4 and the length of said bundles being substantially the same as the lengths of the fibers
5 forming said bundles, and wherein at least 85% of said fibers of said fiber bundles have a
6 diameter of between about 7-500 microns; and
7 wherein said fibers in said fiber bundles are held together with a substantially water
8 insoluble sizing.

1 2. A non-woven mat as recited in claim 1 wherein at least 85% of said fibers in said
2 bundles have a length of between 5-100 mm.

1 3. A non-woven mat as recited in claim 2 wherein at least 85% of said fibers in said
2 bundles have a diameter of between 7-35 microns.

1 4. A non-woven mat as recited in claim 1 wherein at least 10% of the fibers in said
2 fiber bundles comprise reinforcement fibers selected from the group consisting essentially
3 of glass, aramid, carbon, polypropylene, acrylic, and PET fibers, and combinations thereof.

1 5. A non-woven mat as recited in claim 1 wherein at least 50% of the fibers in said
2 fiber bundles comprise glass fibers.

1 6. A non-woven mat as recited in claim 1 wherein at least 85% of said fibers in said
2 bundles have a length of between 5-100 mm, and wherein at least 85% of said fibers in
3 said bundles have a diameter of between 7-35 microns.

1 7. A woven mat as recited in claim 4 wherein at least 85% of said fibers in said fiber
2 bundles are selected from said group.

1 8. A woven mat as recited in claim 1 wherein at least 85% of said fibers in said fiber
2 bundles have a length of between about 7-50 mm.

1 9. A woven mat as recited in claim 1 wherein said mat has a density of between
2 about 50-900 g/m².

1 10. A woven mat as recited in claim 1 wherein at least 85% of said fibers in said
2 fiber bundles have between 10-450 fibers/bundle and a length substantially the same as
3 the length of said fiber bundle, and a diameter between about 7-35 microns; and wherein
4 the sizing is epoxy resin or PVOH.

1 11. A non-woven mat of chopped strands, comprising:
2 a plurality of fibers disposed in a non-woven configuration to define a mat;
3 at least 20% of said fibers in fiber bundles having between 5-450 fibers per bundle
4 and the length of said bundles being substantially the same as the lengths of the fibers
5 forming said bundles, and wherein at least 85% of said fibers of said fiber bundles have a
6 diameter of between about 7-500 microns; and
7 wherein said mat has a substantially uniform density of less than 75 g/m².

1 12. A non-woven mat of chopped strands, comprising:
2 a plurality of fibers disposed in a non-woven configuration to define a mat;
3 at least 20% of said fibers in fiber bundles having between 5-450 fibers per bundle
4 and the length of said bundles being substantially the same as the lengths of the fibers
5 forming said bundles, and wherein at least 85% of said fibers of said fiber bundles have a
6 diameter of between about 7-500 microns; and
7 wherein said mat has a substantially uniform density of between about 50-150 g/m².

1 13. A non-woven mat as recited in claim 12 wherein at least 60% of said fiber
2 bundles have between 10-200 fibers per bundle, and wherein substantially all the fibers in
3 the bundles are substantially straight.

1 14. A method of producing a non-woven chopped strand mat comprising:
2 (a) forming a slurry of fibers in a liquid or foam wherein at least 20% of the fibers in
3 the slurry are in fiber bundles in which the fibers are held in the bundles by a substantially
4 non-water soluble sizing;

5 (b) forming a non-woven web from the slurry on a foraminous element; and
6 (c) withdrawing at least one of liquid and foam from the slurry on the foraminous
7 element so as to form a non-woven mat.

1 15. A method as recited in claim 14 wherein (b) is practiced at a speed of at least
2 60 m/mi.

1 16. A method as recited in claim 14 wherein (a) is practiced to produce a slurry
2 wherein at least 50% of the fibers are in fiber bundles of between 5-450 fibers with the
3 length of the bundles substantially the same as the length of the fibers making up the
4 bundles, and at least 85% of the fibers in the bundles have a diameter of between about
5 7-500 microns.

1 17. A method as recited in claim 16 wherein (a) is practiced using at least 10% of
2 reinforcing fibers in the fiber bundles, the reinforcing fibers selected from the group
3 consisting essentially of glass, acrylic, aramid, carbon, polypropylene, and PET fibers, and
4 combinations thereof.

1 18. A method as recited in claim 16 wherein (a)-(c) are practiced so as to produce
2 a mat having a substantially uniform density of between about 50-150 gm/m².

1 19. A method as recited in claim 16 wherein (b) and (c) are practiced at a speed of
2 at least 80 m/min.

1 20. A method as recited in claim 14 further comprising producing a second mat
2 from at least a second slurry having a different fiber composition or density than the slurry
3 from (a), and laying the at least a second slurry in a substantially non-mixing manner on
4 the slurry from (a) to produce a composite mat having at least two substantially distinct
5 layers with at least one of different fiber compositions or densities.

1 21. A method as recited in claim 14 further comprising (d) providing at least one
2 surface layer on the mat and affixing the at least one surface layer to the mat with a
3 binder.

1 22. A method as recited in claim 21 further comprising curing the binder from (d)
2 and drying the web in a drying oven.

1 23. A method as recited in claim 14 wherein (a)-(c) are practiced using a moving
2 web of fabric which becomes part of the mat produced as a foraminous element.

1 24. A method as recited in claim 14 wherein (a) is further practiced using heat
2 activated binder powder or fibers in the slurry.

1 25. A method as recited in claim 15 wherein (a)-(c) are practiced using foam as the
2 slurring fluid.

1 26. A method as recited in claim 25 wherein (a) is practiced to produce a slurry
2 having between about 0.5-5% by weight fibers.

1 27. A method as recited in claim 26 wherein (a) is practiced to produce a slurry
2 wherein at least 50% of the fibers are in fiber bundles of between 5-450 fibers with the
3 length of the bundles substantially the same as the length of the fibers making up the
4 bundles, and at least 85% of the fibers in the bundles have a diameter of between about
5 7-500 microns; and wherein (a) is practiced using at least 10% of reinforcing fibers in the
6 fiber bundles, the reinforcing fibers selected from the group consisting essentially of glass,
7 acrylic, aramid, carbon, polypropylene, and PET fibers, and combinations thereof.

1 28. A non-woven mat produced according to the method of claim 14.

1 29. A non-woven mat produced according to the method of claim 26.

1 30. A non-woven mat produced according to the method of claim 18, and having a
2 substantially uniform density of about 75 gm/m² or less.

1 31. A method of producing a non-woven chopped strand mat comprising:

2 (a) forming a slurry of fibers in a liquid or foam wherein at least 20% of the fibers in
3 the slurry are in fiber bundles having between 10-450 fibers/bundle and a length
4 substantially the same as the length of said fiber bundle, which length is between 5-100
5 mm for at least 85% of the fibers in bundles, and a diameter of the fibers in bundles of
6 between 7-500 microns;

7 (b) forming a non-woven web from the slurry on a foraminous element; and

8 (c) withdrawing at least one of liquid and foam from the slurry on the foraminous
9 element so as to form a non-woven mat.

1 32. A method as recited in claim 31 wherein at least 10% of the fibers in the fiber
2 bundles comprise reinforcement fibers selected from the group consisting essentially of
3 glass, aramid, carbon, polypropylene, acrylic, and PET fibers, and combinations thereof.

4 33. A method as recited in claim 31 wherein (b) and (c) are practiced at a speed of
5 at least 80 m/min, and wherein (a)-(c) are practiced using the foam process, and wherein
6 (a) is practiced to produce a slurry having between about 0.5-5% by weight fibers and
7 without viscosity-enhancing additives.

8 34. A composite product comprising outer layers made from resin impregnated and
9 cured mats according to claim 3, and an inner layer of at least one of inexpensive fibers,
1 scrap fibers, and material of significantly lower density than said outer layers.

1 35. A fiber-based web manufactured by the foam process and comprising at least
2 two layers, or parts of layers, with different physical or chemical properties.

3 36. A non-woven fibrous composite web manufactured by using a liquid or foam
4 based process, and by using a multi-layer headbox or divided headbox, the composite web
5 comprising at least two layers, or parts of layers, having substantially different properties,
6 including at least one of different density, different material, different reinforcement
7 threads, and different reinforcement webs.

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